

## CLAIMS

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is as follows:

- 1        1. A fiber optic transducer for measuring shear  
2        force or flow rate comprising  
3                a floating head,  
4                a reference surface,  
5                a cantilever means extending between said  
6        reference surface and said floating head, and  
7                a plurality of integral fiber optic sensors  
8        arranged to sense relative motion between said  
9        reference surface and said floating head, each said  
10      integral fiber optic sensor comprising  
11                a tube,  
12                a fiber optic element having an end  
13        within said tube, and  
14                a reflective surface positioned by  
15        said tube at a location spaced from said  
16        end of said fiber optic element by said  
17        tube.
- 1        2. The transducer as recited in claim 1 wherein  
2        said plurality of integral fiber optic sensors are  
3        symmetrically arranged around said cantilever.
- 1        3. The transducer as recited in claim 2 wherein  
2        said plurality of integral fiber optic sensors  
3        comprise two integral fiber optic sensors.

1       4. The transducer as recited in claim 1 wherein  
2       said plurality of integral fiber optic sensors  
3       comprise two integral fiber optic sensors.

1       5. The transducer as recited in claim 1 wherein  
2       some of said plurality of integral fiber optic  
3       sensors are bonded to said cantilever means.

1       6. The transducer as recited in claim 1 wherein  
2       said reflective surface is formed by an end of an  
3       optical fiber.

1       7. The transducer as recited in claim 1 wherein  
2       said end of said optical fiber is substantially  
3       flat.

1       8. The transducer as recited in claim 1, further  
2       including  
3                a housing surrounding said cantilever means and  
4                said plurality of integral sensors.

1       9. The transducer as recited in claim 8, wherein  
2       said housing includes a bellows sealed to said  
3       floating head.

1       10. The transducer as recited in claim 9 wherein  
2       said bellows further includes a spring.

1       11. The transducer as recited in claim 1 wherein  
2       said cantilever means is formed of an alloy.

1       12. The transducer as recited in claim 1 wherein at  
2       least two of said integral sensors are matched for  
3       responses to temperature and pressure.

1       13. The transducer as recited in claim 1 wherein at  
2       least two of said plurality of integral sensors are  
3       substantially insensitive to temperature variation.

1       14. The transducer as recited in claim 1 wherein an  
2       integral sensor of said plurality of integral  
3       sensors includes a plurality of gaps.

1       15. A flow rate or shear force telemetry system  
2       including

3                a fiber optic transducer for measuring shear  
4                force or flow rate comprising  
5                a floating head,  
6                a reference surface,  
7                a cantilever means extending between said  
8                reference surface and said floating head, and  
9                a plurality of integral fiber optic sensors  
10              arranged to sense relative motion between said  
11              reference surface and said floating head, each said  
12              integral fiber optic sensor comprising

13                a tube,  
14                a fiber optic element having an end  
15              within said tube, and  
16                a reflective surface positioned by  
17              said tube at a location spaced from said  
18              end of said fiber optic element by said  
19              tube, and  
20              signal processing means including common mode  
21              signal rejection processing.